Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:

Digital Audio Broadcasting Systems
And Their Impact on the Terrestrial
Radio Broadcast Service
(MM Docket 990325)

Comments of Charles Hutton

These comments are the product of my Electrical Engineering background including experience with design of wireless OFDM based systems carrying compressed audio.

Overview

I believe the IBOC analysis so far represents a manufacturer's viewpoint and is expressly designed to present IBOC in a light that will be favorable to the manufacturer. Incomplete and carefully selected tests have given the impression that IBOC nighttime impact is almost non-existent yet actual listening by third parties gives a drastically different picture.

It is suggested that an independent analysis be performed using methodologies not provided by the equipment manufacturer but rather by an independent group interested only in a technical evaluation.

IBOC Interference to Adjacent Channels

In spite of very limited testing and deployment, IBOC interference has been reported inside the primary coverage areas of AM stations. IBOC interference has also been commonly reported inside the nighttime protected contours of AM stations.

The tables in the appendix show interference powers in various situations. A worst case situation would be two 50 kW stations on each first and second adjacent channel. Such a situation produces 5684 Watts of interference in a receiver with a 10 kHz passband, 4345 Watts with a receiver with a 7.5 kHz passband, and 2999 Watts with a receiver with a 5 kHz passband.

Were an application to be filed with the FCC for a co-channel station with the above powers, it would surely be rejected.

Lack of AM IBOC Stereo Coverage Information

Current iBiquity documents released to the public do not show the coverage area for stereo AM IBOC. As stereo reception requires a higher signal to noise ratio than mono, stereo coverage is sure to be less than that for mono. Mono coverage is less than that for existing analog coverage, leaving one to wonder whether stations will find it worthwhile to invest in IBOC to achieve less coverage than the current coverage which is often insufficient as cities expand.

iBiquity's Rules For Nighttime Acceptability Are Not Those of the FCC

iBiquity's conclusion that nighttime IBOC is acceptable is based on the premise that skywave does not matter and that only the Arbitron market matters. There is an obvious conflict with the FCC's nighttime protection rules, with the most extreme being the .5 mV/m protection afforded some stations.

Further iBiquity positions that seem dubious include the use of the best performing radio as the basis for nighttime acceptability testing, and that directional antennas wil be used by consumers as an interference rejection tool; radios are usually placed according to convenience.

Non-Applicability of the NRSC Mask to IBOC

The NRSC mask was designed solely for transient analog interference and should not be used to evaluate the acceptability of IBOC. IBOC subcarriers are each transmitted 100% of the time and yield an effective interference that is much higher than transient products with analog modulation.

Appendix A – IBOC Interference Calculations

IBOC INTERFERER ON SINGLE 1ST ADJACENT

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	30	31	32
5.0	150	155	159
10.0	300	309	318
50.0	1499	1546	1592

IBOC INTERFERERS ON BOTH 1ST ADJACENTS

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	60	62	64
5.0	300	309	318
10.0	600	618	637
50.0	2999	3092	3184

IBOC INTERFERER ON SINGLE 2ND ADJACENT

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	0	12.5	25
5.0	0	62.5	125
10.0	0	125	250
50.0	0	625	1250

IBOC INTERFERERS ON BOTH 2ND ADJACENTS

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	0	25	50
5.0	0	125	250
10.0	0	250	500
50.0	0	1250	2500

IBOC INTERFERERS ON SINGLE 1ST ADJACENT AND SINGLE 2ND ADJACENT

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	30	43	57
5.0	150	217	284
10.0	300	434	568
50.0	1499	2172	2842

IBOC INTERFERERS ON SINGLE 1ST ADJACENT AND BOTH 2ND ADJACENTS

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	30	56	82
5.0	150	280	409
10.0	300	560	818
50.0	1499	2799	4092

IBOC INTERFERERS ON BOTH 1ST ADJACENTS AND SINGLE 2ND ADJACENT

IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	60	74	89
5.0	300	372	443
10.0	600	744	887
50.0	2999	3718	4434

IBOC INTERFERERS ON BOTH 1ST ADJACENTS AND BOTH 2ND ADJACENTS

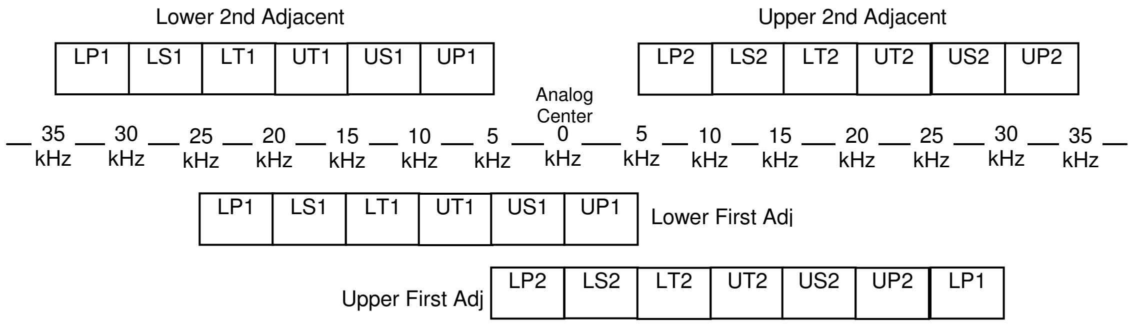
IBOC station's analog power	IBOC power (Watts) seen when tuned to analog center		
	IF BW = +/- 5 kHz	IF BW = +/- 7.5 kHz	IF BW = +/- 10 kHz
1.0	60	87	114
5.0	300	434	568
10.0	600	869	1137
50.0	2999	4345	5684

Table 1: Rules For IBOC Subcarrier Interference

# of 1^{st} adjacents	0	0	0	1	1	1	2	2	2
# of 2^{nd}	0	1	2	0	1	2	0	1	2

adjacents									
Audio BW 5 kHz	-	-	-	US1 UP1	US1 UP1	US1 UP1	US1 UP1 LP2 LS2	US1 UP1 LP2 LS2	US1 UP1 LP2 LS2
Audio BW 10 kHz	-	UP1	UP1 LP2	UT1 US1 UP1	UT1 US1 UP1 UP1	UT1 US1 UP1 UP1 LP2	UT1 US1 UP1 LP1 LS1 LT1	UT1 US1 UP1 LP1 LS1 LT1 UP1	UT1 US1 UP1 LP1 LS1 LT1 UP1 LP2
Audio BW 15 kHz	-	US1 UP1	US1 UP1 LP2 LS2	LT1 UT1 US1 UP1	LT1 UT1 US1 UP1 US1 UP1	LT1 UT1 US1 UP1 US1 UP1 LP2 LS2	LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2	LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2 US1 UP1	LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2 US1 UP1 LP2 LS2
Audio BW 20 kHz	-	UT1 US1 UP1	UT1 US1 UP1 LP2 LS2 LT2	LS1 LT1 UT1 US1 UP1	LS1 LT1 UT1 US1 UP1 UT1 US1 UP1	LS1 LT1 UT1 US1 UP1 UT1 US1 UP1 LP2 LS2 LT2	LS1 LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2 US2	LS1 LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2 US2 UT1 US1 UP1	LS1 LT1 UT1 US1 UP1 LP2 LS2 LT2 UT2 US2 UT1 US1 UP1 LP2 LS2 LT2

Red = 1^{st} adjacents, blue = 2^{nd} adjacents



Where:

LP1 = Lower Primary Sideband of Lower Adjacent Signal
LP2 = Lower Primary Sideband of Upper Adjacent Signal
UP1 = Upper Primary Sideband of Lower Adjacent Signal
UP2 = Upper Primary Sideband of Lower Adjacent Signal
LS1 = Lower Secondary Sideband of Lower Adjacent Signal
LS2 = Lower Secondary Sideband of Upper Adjacent Signal
US1 = Upper Secondary Sideband of Lower Adjacent Signal
US2 = Upper Secondary Sideband of Lower Adjacent Signal
LT1 = Tertiary Sideband of Lower Adjacent Signal
LT2 = Tertiary Sideband of Lower Adjacent Signal
UT1 = Tertiary Sideband of Lower Adjacent Signal
UT2 = Tertiary Sideband of Lower Adjacent Signal